CAM

Published by the Directorate of Mechanical Maintenance, N.D.H.Q., Ottawa, Canada

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C363
v.1,
no.6

VOLUME 1 NUMBER 6 MARCH 1944

Exhaust

CAM

MARCH – 1944
VOL. 1 No. 6

Automotive transportation is the life-line of all modern land armies.

This is a fundamental truth, now realized and fully accepted by all military leaders.

That automotive transportation cannot exist without maintenance is an equally fundamental and obvious fact.

But maintenance, in itself, does not provide efficient transport. Maintenance—in terms of workshops—can be likened to the doctor who is called upon after the patient has neglected his health and reached a stage where a major operation has become necessary. Often a cure can be affected over a period of time, but this means the patient is out of circulation—non-productive and has become an expensive liability.

The obvious inference in this simile is that preventive measures could have overcome the necessity for such drastic action.

Preventive maintenance represents the vitamins that maintain the vehicle's health and help to avoid the costly and non-productive necessity of workshop repairs.

This sounds simple. It is simple—provided that Preventive Maintenance is properly understood and thoroughly realized by every driver, mechanic and M.T. officer in the Canadian Army.

Preventive Maintenance has been defined as . . . "a planned, systematic and continuous procedure . . . religiously enforced by inspecting, adjusting, correcting and testing all units and parts of the vehicle . . ."

"A systematic and continuous procedure . . . that's the punch line, and until the driver, his N.C.O. and unit M.T. officer take that fact to heart and make the C.P.M.S. their chief concern, then the largest percentage of vehicle fatalities must be attributed to lack of preventive maintenance.

By correcting little faults before they become big ones necessitating major repairs, preventive maintenance returns a large dividend for a small investment.

This investment—the careful application of preventive maintenance—is your stake in the war. Without it, the mobility of firepower and supply services are materially impaired—we now know beyond peradventure that mobility is vital to victory.

The mobility of the Canadian Army is directly dependent on our preventive maintenance efforts.

CAM is published monthly in the interests of Mechanical Maintenance, and directed to the non-commissioned officers and men of the Canadian Army.

Your contributions of articles and ideas are welcome. Address all correspondence to the Editor, CAM, Directorate of Mechanical Maintenance, Department of National Defence, Ottawa.

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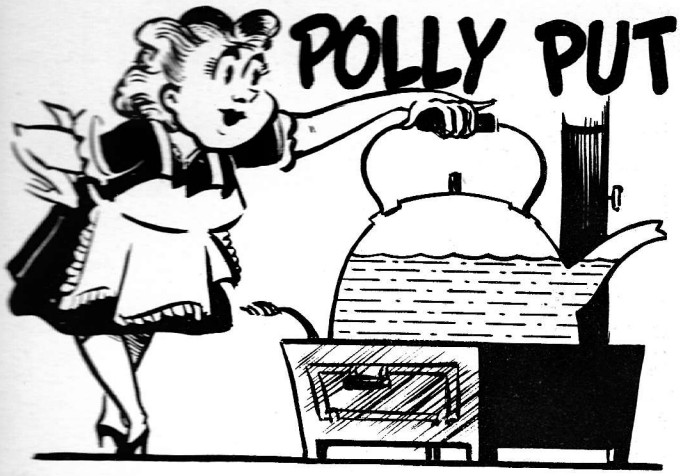

POLLY PUT THE KETTLE ON!

WE WANT TO SEE HOW A CARBURETOR WORKS!

Perhaps it has never occurred to you when you sat gazing at an ordinary tea kettle boiling on the kitchen stove that you were looking at carburetion—it didn't to us either—'til the Professor slipped us the draft of this article. Ever since, we've been confounding Polly by asking her to put the carburetor on and we'll all have a manifold of mixture.

Anyway, based around that tea kettle you will find the carburetor

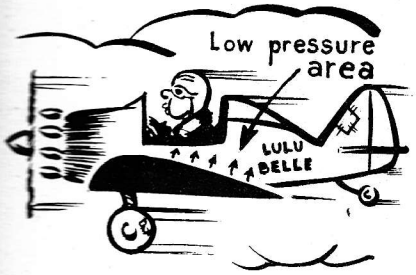

Fig. 1

that's used to supply the necessary mixture of gasoline and air that operates the engine of your vehicle. Of course, for one reason and another the automotive designers have changed the general appearance of the carburetor so that it doesn't look much like a kettle anymore, but the principles are still there and by visualizing a carburetor in this way its function will be simplified, and what might appear to be an intricate gadget surrenders to the application of a knowledge of how and why a carburetor gets that way.

First of all, a quick look at Polly and her tea kettle (if you can't stand looking at Polly just the tea kettle will do) will show you that the liquid is exactly the same height in the spout as in the kettle itself. This of course is one of nature's laws that Archimedes brought to light way back before coupons were required for such experiments—and is due to the fact that pressing equally on the liquid in the kettle and the spout is one atmosphere of pressure—or the weight of the atmosphere (air), which at sea level is 14.7 lbs per square inch.

Now if we turn on the heat under the kettle—and assume we have no vent hole in the lid—we can cause a greater pressure inside the kettle than the outside pressure on the liquid in the spout and first thing you know the liquid inside the kettle would be forced out the spout and spilled.

In our vehicle however we don't want to have a kitchen stove sitting under the carburetor so we use another means of getting the liquid to spill out the spout—namely a **venturi.** "What's a venturi?"—we'll answer that by asking, "have you ever seen an aeroplane wing?" (Fig. 1.)

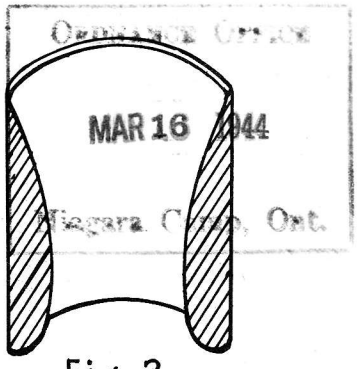
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Fig. 2

Notice the shape or camber of the upper surface of the wing—this camber creates an area of low pressure at the point indicated on the upper surface of the wing. The normal atmosphere pressure 14.7 lbs per sq. in. on the lower surface acting against this lower pressure on the upper surface gives the wing its lift. The pressure difference between the two surfaces will vary with the velocity of air passing over the camber of the upper wing surface. A simple way to prove this is to take

a sheet of note paper and holding it like Gus in the picture, blow gently across the top of it—notice how it lifts?—that's due to the pressure difference between the upper and lower surface caused by venturi action. Now if we roll this piece of paper into a barrel shape—retaining the camber—we have a venturi as used in a carburetor. (Fig. 2) Our next step then is to attach our venturi to the tea kettle so that we can cause the liquid to spill out the spout without the aid of the kitchen stove. So we place the venturi around the spout (Fig. 3) and by means of the pumping action of the pistons in the motor, cause a stream of air to rush through the venturi. This stream of air is speeded up by the venturi and we get our area of low pressure (or lift) around the spout. With a pressure difference created (the pressure being greater on the liquid in the kettle that on the liquid in the spout) fuel is pushed up the spout, spilled and carried away into the cylinders by the air stream.

The venturi and spout works swell but it soon becomes evident that it might not always be convenient to have our engine going full speed—so some sort of a door is needed to control the amount of mixture going into the engine. So we have the throttle valve. (Fig. 4).

Now another problem comes up. When the engine was operated at high speed it was found necessary to

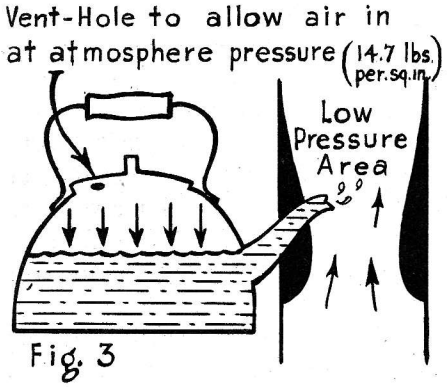


Fig. 3

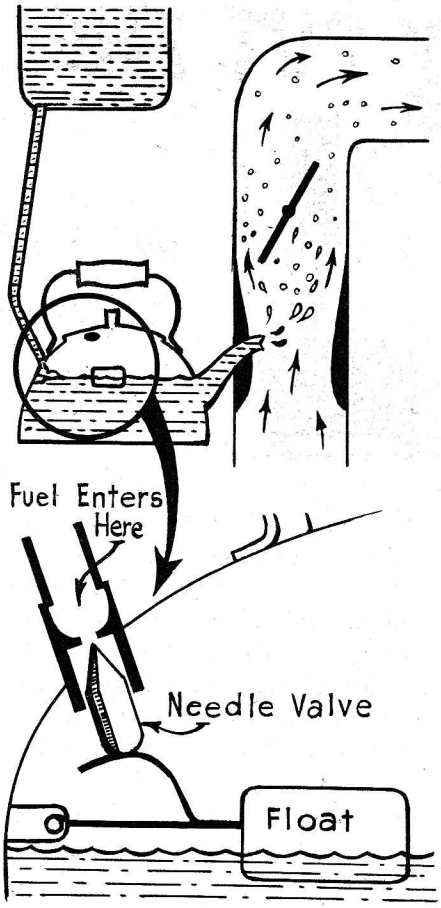
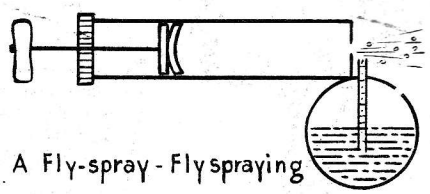


Fig. 4

continually add liquid to the kettle to keep a constant level in it. Concentrating on this matter in the bath room one day our problem was solved automatically—the closet—float—valve—just like that. So this simple little set-up is added to our kettle as shown. (Fig. 4 again).

Everything is now hunky dory except at low speeds—our motor just won't idle. When the air velocity in the venturi is decreased due to the closing of the throttle valve we lose our "pressure difference" between the spout and the inside of the kettle and so no fuel is spilled from the spout. Obviously something new must be be added—some sort of a low speed circuit to spray fuel into the intake manifold — spray — flyspray — thats what we wanted. A careful study of a handy fly spray shows that air passing rapidly over the end of a small tube immersed in a liquid would cause the liquid to rise up the tube and enter the air stream giving us a fine spray.

In no time at all we have it added to our kettle as in Fig. 5. The amount of idle fuel mixture was controlled


A Fly-spray - Flyspraying

by the amount of air allowed to pass through an air bleed hole controlled by an adjusting screw so that we can set the idling mixture of our motor to very fine limits.

Having come this far things seemed to be pretty well settled—all except starting. Our motor just doesn't like starting on the same ratio of fuel to air that it normally runs on. After cranking their arms off they felt like choking the thing one day so they did—and it started. Knowing that everyone doesn't get into a murderous mood to start a motor the obvious thing to do is fit a mechanical choke valve. (or door) in the windpipe (or air intake end of the throat) The closing of this door—or choke—gives us a 'rich' mixture—that is—we restrict the amount of air so that the mixture

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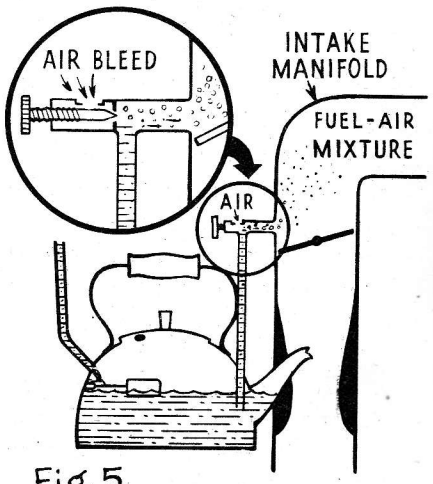
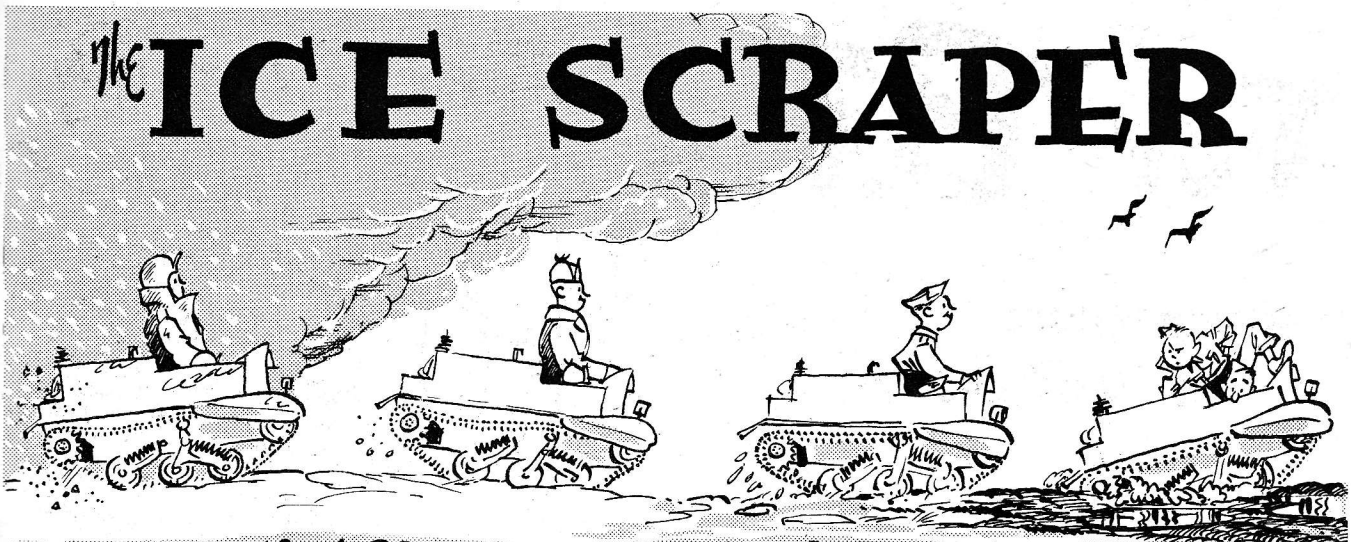
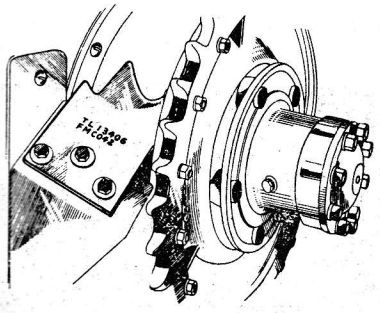


Fig. 5

The ICE SCRAPER



Prowling around among some carriers the other day, we found they were inhabited by two distinct specie of human 'beans'. The two groups could not be distinguished by looks, language or size except that here and there a finger was missing. However, by trailing them field-craft fashion to the canteen, we made an amazing discovery. When downing a coke one group would always say "here's mud in your drum"—the other always countered with "Ice only for me". Determined to see this thing through we finally kidnapped a little corporal and with a promise of a six months' furlough at double pay, got the answer. It seems that on all Universal Carriers an ice scraper mounting bracket is bolted to the hull in front of the rear brake drum and sprocket. However, the scraper blades are not installed on the bracket when the carrier is shipped from the factory but are supplied loose in the vehicle tool kit. The necessary hardware is supplied with the blade to enable it to be bolted to the bracket.

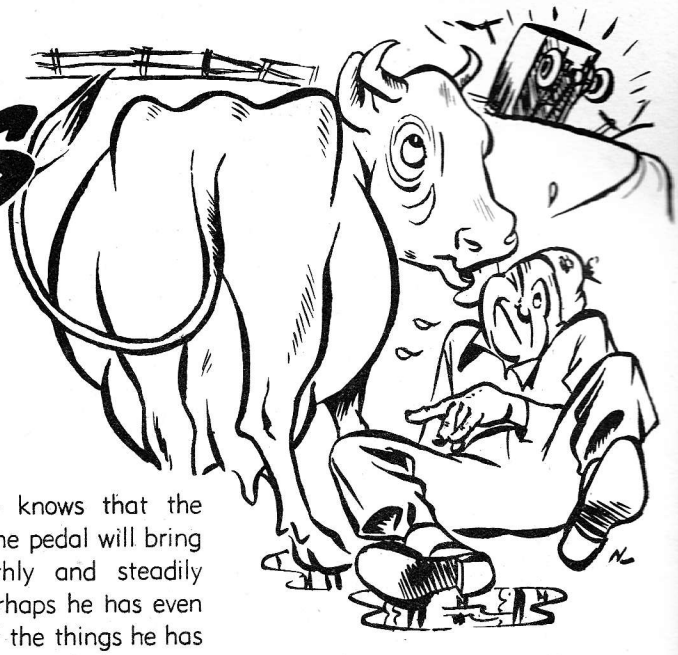


Now, after some of the boys had deduced that those hunks of iron in the tool box were ice scrapers and quite rightly had also deduced that winter was the likeliest time to get ice formed on the brake drums they had fitted them on the brackets just before Christmas.

What about those other birds? Well, they had put the scrapers on as soon as they got their carriers. It happened to be back in September and they had run into trouble in the first mud hole they hit. About four revolutions of the rear sprocket in this mud hole had filled the brake drums so full of mud that the carrier had quit cold and they had the doubtful pleasure of wiling away a good couple of hours cleaning the drums out. At the same time the scrapers were removed from their brackets and consigned to the bottom of a handy pit amid many uncomplimentary, tho' lurid, adjectives. This procedure of course, cured the trouble, but, as we suggested to the little corporal, was hardly cricket In the first place, these scrapers were designed to remove **ice**. So they should only be installed during the months when ice is going to form on the drum. Come mild weather and mud, take them off and store them in the tool box until they're required again.

Those fellows with the fingers missing? The way the little corporal told us, it seems the general tendency when installing the rear hub is to put your hands on the sprocket with the fingers protruding through the teeth, then give the sprocket a turn. If you use your fingers for counting you only get to nine from then on. We hear the latest models will have redesigned scraper brackets to help save fingers but in the meantime it's up to you to watch out for them digits.

For B.F.s



" SPEAKING OF VACUUMS . . . "

Coasting down a steep hill with the engine switched off has always appealed to us as the next best thing to flying. No sound from under the bonnet . . . . a beautiful **swoosh** as the air rushes past . . . and a lovely feeling that nothing else matters—until something appears round a bend.

Yes, until something appears round a bend. The question is "What does A do then?,—A being the B.F. who is rip-snorting down the slope like a holiday-maker on a scenic railway

Let us suppose that he is driving a vehicle with vacuum assisted brakes. Right, he knows that the lightest touch on the pedal will bring the vehicle smoothly and steadily under control. Perhaps he has even understood some of the things he has been taught about a Hydrovac or booster brakes—how the suction power of the engine is used to save his muscles so that the lightest pressure on the pedal provides powerful braking—and so on.

What he forgets is that the engine can only develop that suction power, or vacuum, **when it is running.** By careening down a hill with a **dead** engine he is asking for the same adjective to be placed reverently in front of the word driver.

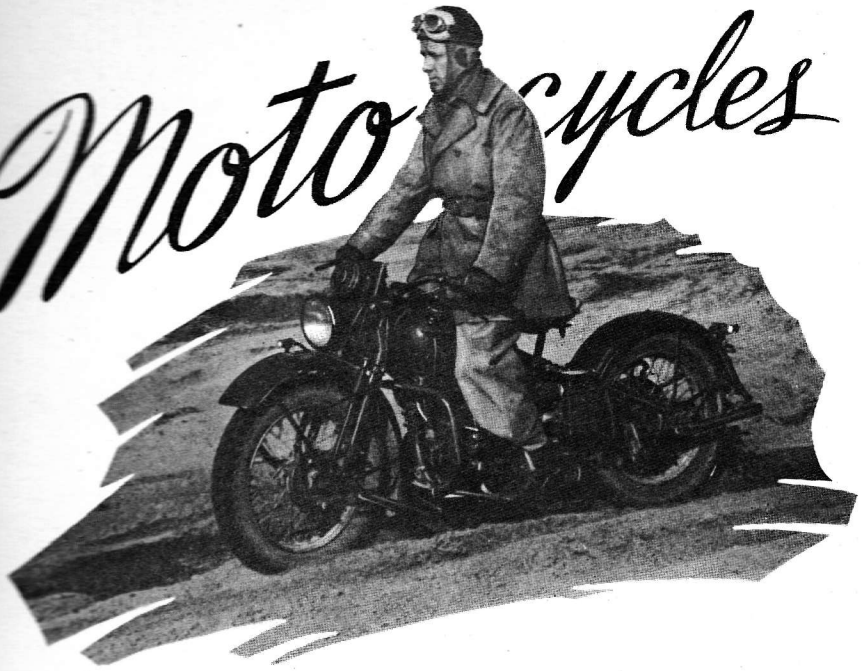
Have you got that? We don't mean that the brakes are useless when the engine is switched off. They are not. They are as efficient as ever. But the vacuum assistance just isn't there, and the driver has to supply all the push with his foot.

What's all the fuss about then, you ask. A reasonable question and we'll try to give it a reasonable answer.

If we remember right, we left our friend, the B.F. whizzing down a slope with his engine switched off. Something, a herd of cows say, has just hove into view round a bend. Now this is where we go all psychological. Our friend knows, because he has generally driven the vehicle with the engine **running,** that a mere caress of the pedal will arrest his progress.—Through sheer force of habit he tries the caress—and nothing happens. His hair stands on end. For a split second he is too dumbfounded to do anything about it. Then he rams the pedal down hard. But he is too late. A lot of things can happen in a split second, and cows are not very quick on the uptake. All that is left is a lot of spilt milk to cry over.

This, as we have said before, is an article for B.F.s. That being so we might as well record the obvious moral. Don't coast with the engine switched off. It saves petrol, we know; it's exhilarating; and it is one of the few ways of achieving a speed which can't be checked by a carburetor governor. But it's also very, very foolish. Unless, of course, you feel quite sure in your own mind that a pint or so of petrol is worth more to the nation than you are.

Motorcycles



CANADIAN ARMY PHOTO

"Lots of guys would be amazed", confided Staff Sergeant Cranberry one day to Sergeant Hutch.

"You don't say"? says Hutch.

"Yep", goes on Staff, "Lots of guys would be amazed at what a lot of difference it makes where you put your feet when riding a m'cycle cross country!"

"You don't say!" says Hutch. "Don't tell me some of the boys have been riding with their feet on the handlebars and . . . "

"These guys," goes on Staff, "just ignore those auxiliary foot rests that the Harley-Davidson company go to the trouble of attaching to their W.L.C. models—if I could only get them to realize what a difference it makes when you use them on the rough stuff".

"Well", says Hutch, "I found it helped sell the idea to them by making a quick demonstration with the bike up on the stand to show how easy it is to get off the saddle **without pulling up on the handlebars,** when your feet are on the auxiliary rests directly below the saddle. It doesn't take any new rider long to find out that a solo m'cycle is steered more by the weight of the riders' body than by actually turning the handlebars. On tricky going, where lots of dodging about is required, this means that the bars must be held fairly freely—the arms relaxed—and the body given maximum freedom to shift its weight from one side to the other. You sure can't do this if you're pulling yourself up off the saddle by the handlebars—and if your feet are on the footboards that's the only way you can raise your fundamental from the seat."

"Agreed", says Staff", and with over a quarter ton of motorcycle a guy's got to use his body weight to control it properly—and also save getting the livin' daylights shook outa him if he's making any sort of time over a really bumpy stretch. Poised on the auxiliary rests with his legs slightly bent at the knees, a rider can let a bike "bucket" and bounce like a bronco and absorb it without his innards taking a beating. Sittin' in the saddle he'll be pood out and likely to come off after the first fifty yards."

"Yeah, those little folding rests don't look like much but they sure can make a lot of difference to a guys' riding—I guess its kinda hard to convince a fellow that the control of the m'cycle, his safety and comfort can depend on where he puts his feet."

"Well all they have to do", says Sergeant Hutch, "is try it next time—as you say, they'll be amazed at the difference it makes."

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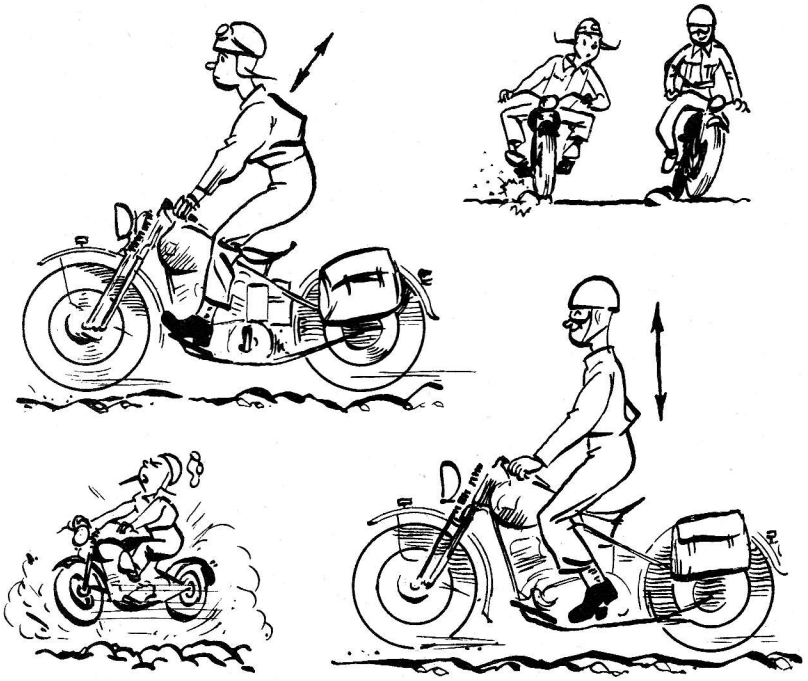


Pamper Your STARTER!

Just a little thought will portray to you just how important the battery starting switch and starting motor are. Being among the lowly species of the automotive kingdom they are given little or no credit for the big job which they do—but are quite frequently stepped on. In spite of the duties they perform the starter switch and motor require very little attention and unfortunately seldom get any. But let them lay down on the job and see what happens. Usually the one responsible for their failure blames the manufacturers by hiding behind destructive criticism about the design of these units. "The designs not right"—"it's made with poor material"—"never was any blinkin' good" and such offhand remarks that might be expected from some armchair mechanic are the usual excuses heard.

But extensive investigation into the failures of these units has proven that the so-called short life is generally caused by some form of neglect or misuse.

Let's take the starter switch. When applying pressure on the starter pedal for cranking the engine the pressure should be applied firmly and squarely on the pedal, or in the case of a starter button on the dash—firm, even pressure should be applied to make sure of good contact within the switch.

A small matter to make a fuss about? Well, read on and we'll see.

It was found that the condition which generally shortens the life of starting motors and switches is

arcing—the flow of current across an air gap between two electrical conductors. You see, when current is rushing along a wire it hates to stop. This is O.K. when we want the current to rush, but there are times when we want to stop it. So a switch is put in the circuit. The switch puts a break in the wire to provide an air gap as an obstacle to the current. But as the switch is being opened, the air gap is not as large as when the switch has reached the full open position. The current racing madly down the wire overcomes the small air gap and jumps across to the opposite conductor. When that happens we get a hot flashing arc of electricity. If something causes the switch to make and break the circuit in rapid succession and if the wire is carrying heavy amperage, these hot arcs will quickly melt and perhaps weld the contact points of the switch.

The normal current flow varies between 125 and 175 amperes through the starting switch during the starting period but is sometimes as high as 275 amperes, depending on surrounding temperatures and the condition of the starter motor and would be higher if the starter motor showed signs of abnormal wear. With such a high amperage flowing through the switch, arcing will occur at the switch contacts unless firm pressure is applied when the switch is used.

If the pressure applied is not sufficient to form a good contact, there is a possibility that the arcing might fuse, or weld the contacts together. Then when you take your foot off the starter pedal, the starter will continue to operate until the cows come home, or more practically, something is done to break the circuit. Care should be taken in view of this to be sure that the pressure is applied squarely to the pedal thus preventing any resistance from side pressure causing less pressure on the switch contacts.

The manufacturers know that arcing causes the switch contacts to fuse, so they designed the switches to break the circuit quickly, thus cutting down on the amount of arcing. They also used materials that will stand a considerable amount of heat. Therefore we can't blame the manufacturer for what happens.

An undercharged battery will have a rather peculiar effect on magnetic-type starter switches. Although the voltage of the battery is sufficient to magnetize the switch thus closing the contacts, immediately the contacts close the additional demand of the starter on the battery, lowers the voltage, the magnetic pull on the switch is not sufficient to overcome the spring which breaks the switch contacts and a very rapid vibrating action results. While the switch is vibrating, the arcing at the contacts pits them and will eventually render the switch useless.

Before going to the starting motor itself, let's take a look at the start-

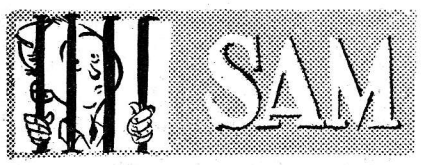
ing circuit.

Loose connections in the starting circuit cause high resistance which in turn results in heat. If the cables connected to the starter switch leading from the battery to the starting motor are loose, sufficient heat will be generated to burn the insulation on the switch terminal posts—the same applies to the starter terminal posts and the battery posts.

This practice of leaning in the door of the vehicle to push on the starter pedal with the hand while Joe Mush takes a compression reading is not only hard on starter switches but it is hard on the heart. In fact just the other day Junior tore the cartilage between his ribs doing just this thing.—So no inching touches or featherweight pushes, if you must help Joe adjust the valves, sit in the vehicle and operate the switch as it should be operated. In fact if Joe wants the engine turned just a teensy weensy bit, use the crank. You will have better control anyway.

Remember the starting motor? It's that thing that usually has to be found with the aid of dredging equipment to get through the layers of greasy muck which is allowed to accumulate. Well, that badly neglected unit is what saves you from walking around with a broken arm and crankers' nerves. In spite of the work it does, it asks little in return but what it does ask for it really needs. It would be ever so grateful if you remove the grease and dirt from the outside occasionally and apply the necessary few drops of oil as mentioned in your lubrication guides. Mind you, we don't mean too much oil, because due to it's poor digestion, too much oil will accumulate on the commutator and eventually form an insulating film there which will bring about arcing at the brushes. Another cause of arcing at this point is high mica between the segments. Periodical inspection of the commutator and the use of 00 sandpaper when found necessary will prevent this condition from reaching the stage at which the starter won't work at all.

Just remember how you like to crank an engine and determine from that whether or not it pays to see that these points are given the attention called for in the preventive maintenance schedule and we're sure you will agree that there's less chance of skinning your knuckles doing a C.P.M.S. than there is doing the unnecessary work of winding a crank, removing a starting motor, or knocking the manufacturers.



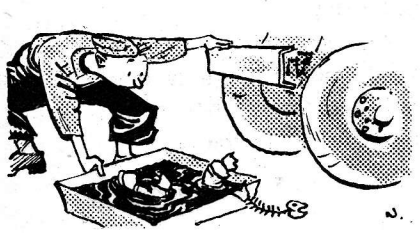
Now Sam's listened for 'ours to lectures
Concernin' the care of 'is charge,
But 'e sez to 'imself, "take no notice,
It's nowt but a lot 'o their barge.

When they gave 'im a lorry to 'andle
Saying, "now then lad, sithee, that's fine,
But see that tha' looks to its innards,
as tha' looks in the canteen to thine".

They told 'im that right lubrication
Would save 'im a packet of woe,
That dip stick were there for a purpose
Not just there for fancy or show.

They said oil, like a baby's requirements
Wanted changin' wi' frequency too;
'E'd be proper amazed at th' assortment
'E'd find if 'e left it to stew

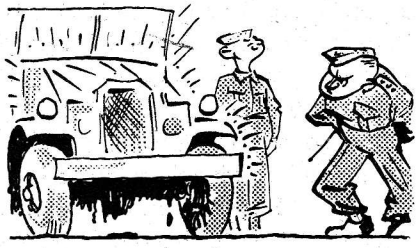
But they might 'ave been talkin' to duff balls
For the interest Sam took from the start,
An' the sergeant said, "All 'e'd a 'ead for
Were to keep both 'is ear'oles apart.



As long as 'e'd summat in t'sump'ole,
Though it might look like treacle and dough,
'E said, "Why the 'eck should I worry,
So long as she keeps on the go?

'Opin to pass the inspection
'E'd polish the top all 'e knowed,
But the underneath side o' 'is lorry
Looked like summat tha' sees in t'road.

Well as you'd imagine, our 'ero
Were always in trouble o' sorts,
If 'e were'nt in for runnin' a bearin'
'E were gettin' some stinkin' reports.



The C.S.M. ups and tells 'im,
"Just mark this, me lad, mark it well,
If you don't start to look to your vehicle
What you'll catch will rhyme in 'ere swell."

"When I look at the state of yer engine,
I wonder the blamed thin'll function
Yer filters is choked up wi' rubbish
'Ere, Sam, lad, wherever's tha' gumption"?

"I'd like to make thee drink thy ration
Through gauze that th' petrol's to pass,
Or stuff up thee gob wi' t'air filter
When tha's just supped six bottles o' bass."

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GREASE CHANGE

Up until recently you've been using D.N.D. 673 grease for wheel bearings and front axle steering end constant velocity joints. This is known as a "heavy duty" grease and it has been found that in very low temperatures it has tended to get too thick for efficient lubrication. So as per modification bulletin B-2 D.N.D. 672 grease will take its place. D.N.D. 672 is a "general purpose" grease and provides more adequate lubrication over a wider temperature range. We'd gone to press with our article in the January issue on packing wheel bearings before we had word of this change, so you'll want to amend what we said there, along with your Lubrication Guides and Manual of Maintenance and Lubrication, to read D.N.D. 672 at all points where D.N.D. 673 is mentioned.

What about the stocks of D.N.D. 673 you have. Save them for the warm summer months—**store 'em with care** as we point out in our February issue's first article.

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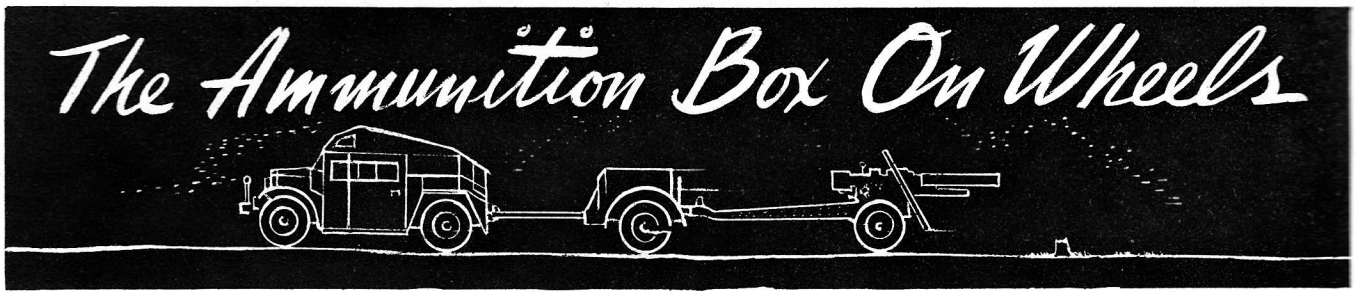
The Ammunition Box On Wheels



The Artillery Trailer that trundles along between the 25 pr. Gun and the F.A.T.—What's it got that other trailers haven't got?—Why is it there?

Well in the first place it carries ammunition—in the second, it makes a nice flexible four wheel tow out of a poorly balanced two-wheel tow—thirdly, the tools and the spares it carries would make a tinkers' heart happy and fourthly it has a very nice over-run brake to help on down grades and when stopping.

Does it need any maintenance?—it sure does. Does it get it?—Well—playing second fiddle to the 25 pounder and the F.A.T. it sometimes gets the worst of the deal. It's the meek little fellow in the middle that doesn't shoot and has no pull.

Lubrication, as you've no doubt heard many times before is one of the mainstays of preventive maintenance. So if you are responsible for looking after one of these trailers see that they get their quota of grease once a week when in use—or monthly if they are just sitting. Incidentally if you take a look at plate 18 in the Handbook for the 25 pr.—(1940) or Fig. 13 in the Maintenance Manual for the 25 pr. (1943) you'll note these call for Oil C600—in Canada that means use D.T.D.143C. We covered the story on wheel bearing lubrication in the January issue of CAM—did you read it? Good—then you'll just pack the bearings—not the whole hub.

How about the brakes? Well the brakes operate two ways—as an over-run brake and as a manual parking brake. The draw eye in the front of the perch is free to push in against a spring loaded push rod and this rod applies the brake. Lets say you are driving an F.A.T. with trailer and gun. As you apply the brakes on the tractor the gun and trailer want to keep going—so the trailer pushes on the draw eye and the brakes are applied to the trailer wheels, which helps you stop. Keep them properly adjusted and the F.A.T. won't get a boot in the fanny every time you stop!—and the gun wont try passing you on down grades either. There is a release toggle and a hand clamp on the front of the perch so that a helper can prevent the brakes being applied when you back up. For parking there is a hand lever. When you have to adjust the brakes—jack up the wheels and proceed as you would for any other brake—except you'll need a helper to push the draw-eye in and out while you adjust for over-run.

Talking about wheels—the trailer wheel and hub assemblies are identical with the ones used on the gun and can be inter-changed—and its a good idea to change them with the gun wheels about once a month to even up tire wear. With the tire situation as it is, the recommend pressure of 40 lbs. (that's the same as for the gun tires) should be strictly checked and maintained.

There are several dozen bolts holding the parts of the trailer together and they should be regularly checked for tightness. Pay special attention to the flange bolts on the perch holding the draw-eye assembly, also at the joint flange in the centre of the perch and above all the bolts holding the draw hook on the back. A nasty accident happens if the draw hook tears off. If these bolts get worn or slack in their holes—replace them with steel bolts of the right size. Better yet, if the holes are worn, the trailer should go to the workshop to have the holes reamed and oversize bolts fitted.

Take a look at the catch on the draw hook frequently to make sure that the catch springs out freely—otherwise rough travelling will unhook the gun and create an embarassing situation—to say the least. There is a grease fitting on the catch—all you have to do is see that it gets regular attention.

There are two bumper bars on the back which are held by spring leaves, so that a driver can't jack-knife the trailer and gun by making too short a turn. If he tries the bumpers hit the rubbing plates on the trail. Make sure the bolts on the bumpers are tight. While you have the wrenches unwrapped go over the door catches, the brackets holding the brake operating gear, the mud guard brackets and stays—they all have a habit of loosening up occasionally.

An ammunition box on wheels? Well, maybe there **is** more to this Artillery trailer than gets a formal introduction to the optic!

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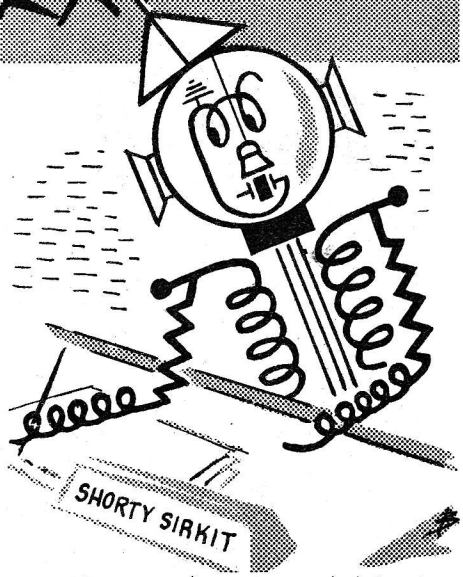
Introducing SHORTY SIRKIT

Prior to this issue, Telecommunications have been conspicuous by their absence from the inky pages of CAM — not that we haven't wanted them but they always looked so darn busy when we passed by— always listening to "John's Other Wife" on a fifty-eight set (Mk. I), practising their fly casting with antenna's or winding coils on coke bottles and so on.

Nervously, we approached them one day through the wire and flashes of static, and much to our surprise they declared themselves right in on the deal. Of course, being so busy they had no one to write up the stuff but it was merely a matter of minutes before they had figured out a circuit and thrown together a Robot, launched and christened him "Shorty Sirkit", and put him to work. He had this copy into us in a matter of half an hour. You've got to hand it to these lads—they're wired for high voltage.



In Telecommunications, we are well aware of the fact that it is not always an easy job to carry out repairs and maintenance when equipment and replacement parts are not immediately available. However the job can be made easier by the exchange of our pet methods of overcoming the problems we are meeting daily in our own workshops. New and easier methods of doing the old jobs are some of the things we want to make available to all of you. Possible new uses for standard test equipment as well as the substitution of one type of test equipment for another in emergencies, and methods of making emergency repairs where they have been worked out in one shop should be made known to all. Our field work is comparatively young and all the information is not in the books nor have all the brilliant ideas been spawned. Even the least of us has ideas that will be of assistance to someone in some other shop and will help to speed the day when we can all go back to our hobbies. All ideas submitted will be tested in the workshop here before being passed on to you so that no misinformation will slip by if we can possibly help it.

We now have several ideas knocking about, such as a method of using the molybdenum and German silver wire from resistors, wire with which the screen grids of vacuum tubes are wound as a replacement for the thermo-couple in R.F. ammeters, and a device for facilitating the adjustment of telephone line unit relays. These are only two examples of the material we have here which is being checked before releasing it.

Remember fellows, this material has to come from you. We, up here, don't have much opportunity to run across these things but we can check them and pass them along to the other fellow. You just send in your pet "kink" or idea, along with suitable sketches if needed to explain it, and we will tend to the rest. Address them direct to The Editor, CAM, Directorate of Mechanical Maintenance, Department of National Defence, Ottawa.

We have just come across some bits of information that should be of interest to you. In fact, we hope you will take it to heart as it may effect an appreciable saving in replacement valves. This data was gathered by a research group from a number of valves returned detective. Of the total returned the tests showed the following figures:

Burned out	21%
Shorted	9%
Weak	14%
Broken bases	20%
Broken Glass	12%
Good condition	24%

These figures tell quite a story. Two types of damage that normally could be avoided account for 32% of all the tubes returned. The 24% found in good condition is the result of several causes one of which is the fact that emmission type valve checkers do not give completely accurate indications of the condition of the valves. Dynamic or Mutual Conductance checkers give a much more accurate indication (The Hickock testers supplied to Canadian Workshops are of this type). Another cause is the fact that the instruments are not being used with as much care as they should. A third reason which is an interesting one is the fact that in many valve checkers the voltage applied to the elements for the short test is over fifty volts. In standard size valves this does not

(Continued on page 100)

Are you a

IF YOU'VE GOT NAZI MARK

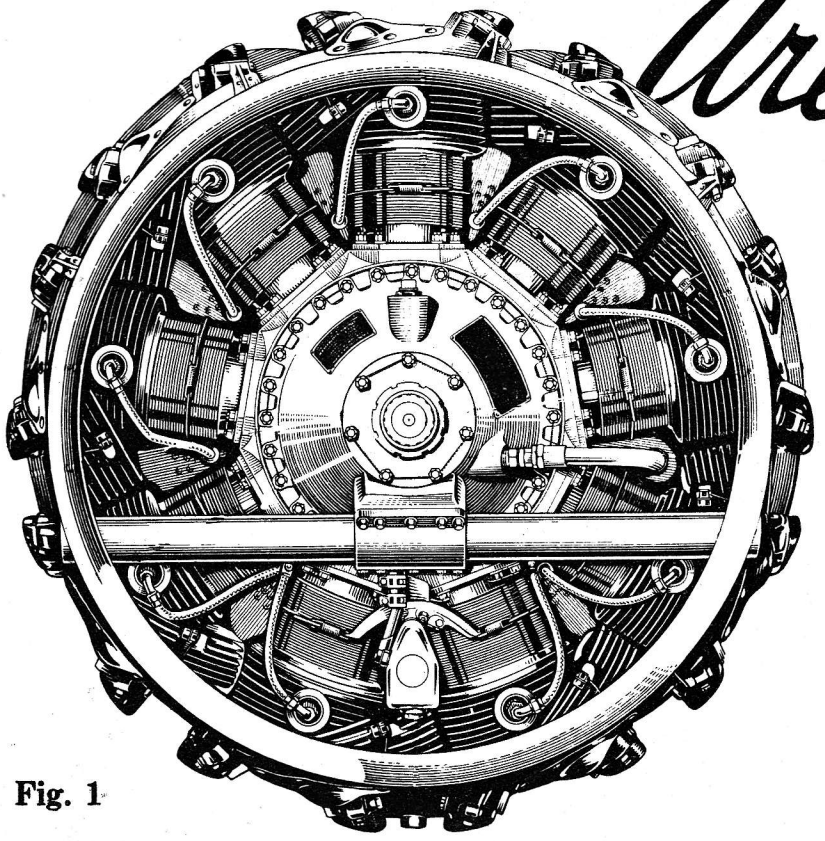


Fig. 1

It's great for a man's ego. It makes him feel infallible. Sit him behind the controls of a 30-ton tank and he's sure to feel powerful. 'Yah! nothing can stop me.' Jam it in gear. Push that accelerator down to the floor. Drop out the clutch. Feel the lurch of the tank as the tracks bite. Give it hell. Pick out the roughest, toughest obstacles. Ram right into or over them. 'Nothing can hurt this vehicle—it's a tank.'

Yes, it's a tank. And because it's a tank, it's subject to more mistreatment than any vehicle in the Army. It's mistreated because lots of men don't realize that a tank is made up of the same type gears, pistons, and bushings as those in any other vehicle—and need the same care.

From the toughest proving ground in the world come reports that our tanks are as good as anything our enemy has—or better. In Libya and on the Russian front they proved that they could stand up under the worst conditions nature could provide. But even the best materials and engineering can't stand up under the murderous treatment of a careless tank driver.

You may have your own ideas on how to destroy a tank but here are a few samples of how some greenguards destroy tanks and then blame it on the materials or design.

STARTING RADIAL ENGINES

Just crawl into the first radial-powered tank you see and start it up—that's all. If the tank's been sitting still for 12 or more hours it's possible for you to break the engine up as effectively as a German 88 could.

Radial engines have a number of cylinders pointing down (Fig. 1); the combustion chamber in each of these cylinders is **under** the piston (Fig. 2). While the engine isn't running, oil and gas may drain from the crankcase into the lower combustion chambers. If the engine is started **without** removing the liquids from the combustion chambers, the pistons are forced to compress the liquids just like air. But, you know that liquids can't be **compressed.** Wham, when the piston hits the oil and gas, something has to give—and it's usually the piston or the cylinder head.

To prevent this tank-busting, a seasoned tank driver will follow S.1 bulletin 50 . . and crank the engine by turning the hand crank over 50 times before starting it.

Cranking the engine forces the pistons to go through the exhaust strokes which pumps the liquids out of the combustion chambers. If you have trouble cranking, you may have to remove the spark plugs so the liquid will have a means of escaping.

If you're ever in doubt as to whether the tank has been cranked over or not, don't take a chance—crank it.

IDLING SPEEDS

Blowing cylinder heads apart and breaking pistons is an effective but crude way of destroying tanks. Once upon a time some B.Fs with a delicate touch developed more subtle methods—idling speeds for example.

These boys stopped their tanks and allowed the engine to idle at 400 to 500 rpm's while they're eating their field rations or calling up Mabel. Somebody said that the smooth ticking of the engine aids their digestion. But this fine, smooth idling of the engine was the calm before the storm. Prolonged low idling speeds on radial engines cause extremely

TANK DESTROYER ?

TO BUST TANKS, BREAK UP THOSE VI's - - NOT YOUR OWN M4's

high temperatures in the cylinder walls and low temperatures in the spark plugs. Also, there's very little oil circulation. First thing you'll notice is misfiring and smoking, caused by fouled plugs. Later as the oil on the moving parts burns off —pistons and cylinders score, bearings wear and in general the engine gets shot.

Radial engines should never be idled at less than 800 R.P.M. and for this reason your engine is now adjusted to idle at this R.P.M.

Diesel engines are also damaged by low idling speeds. If you have to idle them set the hand throttles to idle both engines over 600 rpm.

And while we're on the subject of engine speeds another way to finish off a good engine is to 'lug' it. Lugging a tank means to continue driving it in a high gear after the speed of the engine has slowed down. This generally happens when you're driving in a high gear over smooth terrain and suddenly go into heavy mud or up an abrupt hill. Some greenguards do the same thing by slowing the engine speed in order to slow the tank speed. When the engine rpm's drop, the engine can't develop enough torque (twisting force) to keep the tank moving. The engine loses speed rapidly. You almost hear each cylinder firing individually. During this time the engine is knocking itself apart, the pistons vibrate in the cylinders, power is applied in jerks, the tank shivers, shakes and gasps. Plenty of parts are being ruined while all this is going on.

A good driver never allows the terrain or tank speed to slow up the engine rpm's. He shifts to a lower gear as soon as the tank slows up or if he wants to reduce the tank's speed.

Radial engines, especially, are mutilated by low engine speeds. These engines were designed to run for long periods between 1800 and 2200 rpm. For short periods, they can be run at 1500 rpm. When operated at these speeds they'll give very little trouble. But lug a radial-powered tank along in 3rd, 4th or 5th gear at 1200 or 1300 rpm, and you'll have to change engines at 50 hours.

A good thing to remember is this: whenever you're in a gear higher than 2nd, no matter how slow the tank has to travel, your engine speed **must** be kept above 1500 rpm. If

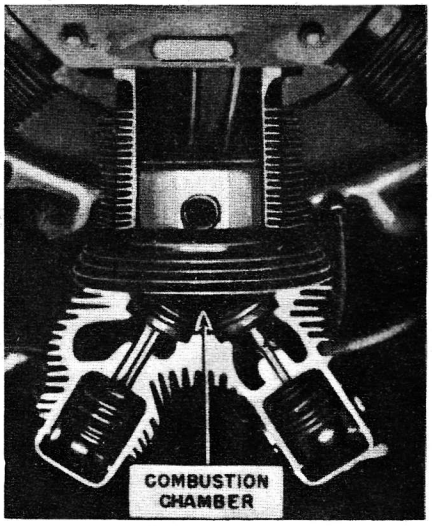


Fig. 2

this causes the tank to travel too fast, shift to a lower gear. Don't ease up on the throttle!

OVERSPEEDING

Gunning a tank too much is bad business too. Every tank has a top governed engine speed, which is the greatest number of rpm's it can stand in prolonged operation. For short runs it can take a ltte more, but not much. See your manual for details.

We won't go into the methods of getting the rpm's to exceed the legal limit, but we've seen it happen, and you probably have too. Some guy roars his engine like a bat out of Hell—then it starts to cough and sputter, won't run smoothly. It's suffering from 'valve surge.' which means the valves can't keep in step with the rapid cam action and therefore go into a fluttering motion of their own. At first there's no permanent harm, but after a while the valve lock washers give up all hope of controlling the crazy valve action; they break and drop the valves into the cylinders. After a piston has beat on a valve a couple of times, you'll have a cylinder full of first-class scrap.

If this doesn't happen first, chances are the engine will overheat, and you know what that means—the lube film in the engine breaks down, and you get scored pistons or bearing failure.

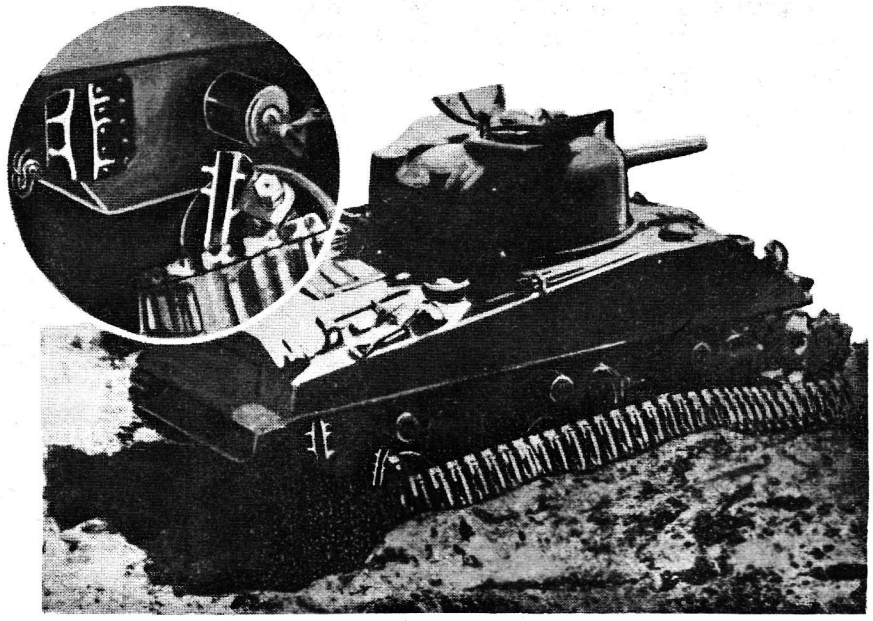


Fig. 3

Overspeeding is especially apt to happen when going down hill. Don't forget you have brakes to take a load off your engine. Maybe it would be a good idea to dig out the October CAM from the bottom of that pile of Breezy Stories and read the article on using the engine as a brake.

CLIMBING HILLS

Even our tanks have limitations and a good tank driver learns them. While watching a tankman putting his medium tank through its paces, we saw a rear idler housing sheared off neatly as if it were done with a cutting torch.

All this driver did was to try to climb the tank over an abrupt hill. But not knowing the right way to handle such a hill, he didn't get over it—but he did put his tank out of operation.

Here's how:

He approached the hill at a sharp angle with the tank transmission in third gear. When the tank hit the soft stuff at the base of the hill it lost speed. By the time the nose of the tank found its way up on the hill (Fig. 3), there was too much load on the engine. It stalled.

Next, the driver started the engine, shifted to creeper gear (1st gear), braked the left track to straighten up and gave her the gun.

Here's what happened:

In trying to run the tank up the hill at an angle the driver was forcing the right track to do all the work. The engine itself develops enough torque in 1st gear to pull the tank up such a hill, but in this case the torque is not applied equally to both tracks. It's being applied mostly to the right track.

Naturally, this pull centered on the right idler housing, and because the housing was never designed to take all the torque necessary to pull 30 tons up a steep grade—it broke (Fig. 4).

Had the driver known his tank thoroughly, he would have charged up the hill at an angle which would allow both his tracks to take part of the load. But, if by chance he found himself in the position shown in Figure 3, a good tank driver would have backed the tank down and changed direction before trying to go over the hill.

A tank is big, all right—and it weighs plenty—and you can knock over a house with one. Just remember, though, that it needs loving care and lots of it.

Baby yours.

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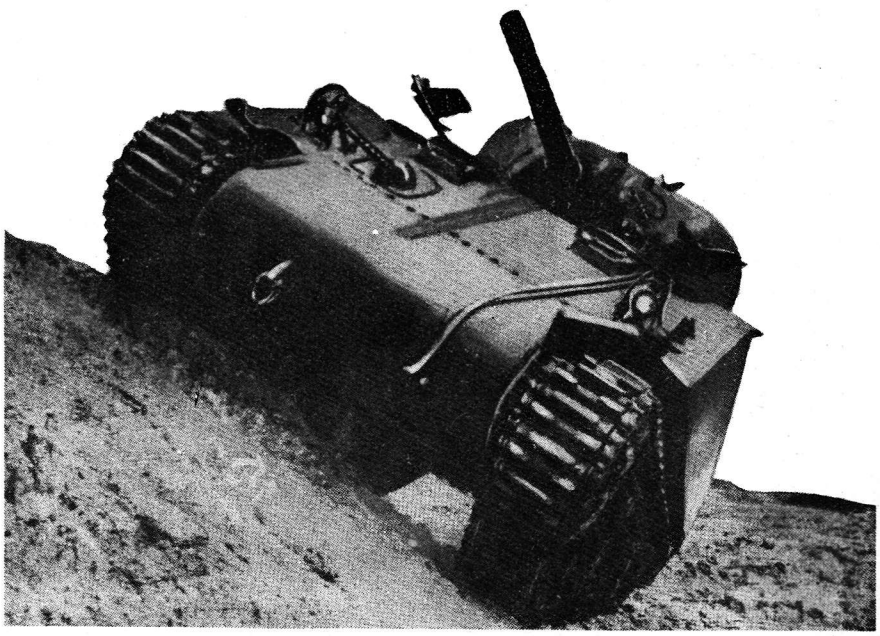


Fig. 4

Cut out the Squawkin'!

There's a reason for all those conduits, coils, straps and gadgets found in lots of vehicles. When they have some idea of that reason, Drivers, Driver Mechanics and Fitters will want to see that they ALL go back in their proper place. That way, they cut out the Squawkin'—in more ways than one.

Have you ever been straining your ear drums on your radio set, when a passing automobile has cut in to make life miserable by adding the sound effects from an old "Chicago after Dark" movie?

"Interference," this is known as to the trade. In Germany, they get rid of interference by "suppression" which

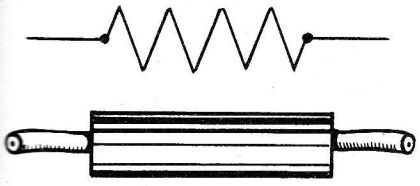


FIG.1. RESISTOR

means lobbing a mortar bomb into the auto, shooting the driver and writing them both off as "non-aryan anyway" Here, we go to a lot more trouble over this matter of suppression—we confine it to the vehicle and keep every one happier in the process.

Properly suppressed, that automobile would not be heard on the radio even if the set were installed right in the vehicle itself.

The interference from a gasoline engine is caused by: 1. the high tension ignition system, 2. the voltage and current regulator, 3. the generator. Each of these has a distinct and separate sound which can be identified readily by any person trained in this work. To eliminate the interference special devices known as resistors, metal shields, condensers and filters are used and the process is called SUPPRESSION.

Resistors, (Fig. 1) usually made up of carbon are used to "wash out" ignition or spark plug noises. On some engines there is a resistor in each high tension lead as close as possible to the spark plug. Another resistor of similar resistance is used in the high tension wire from the coil to the distributor. Resistors give electricity a considerable amount of difficulty (or resistance) in passing them, therefore once the spark has jumped across the spark plug it doesn't want to go jumping back and forth so it stops very quickly and doesn't jump often enough to set up a noise that can be heard on the wireless set.

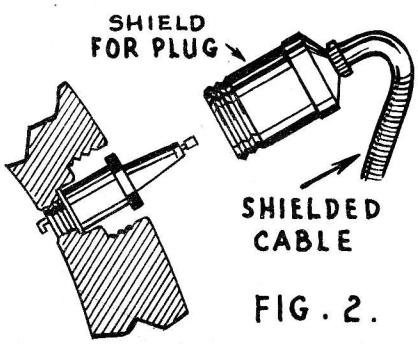


FIG. 2.

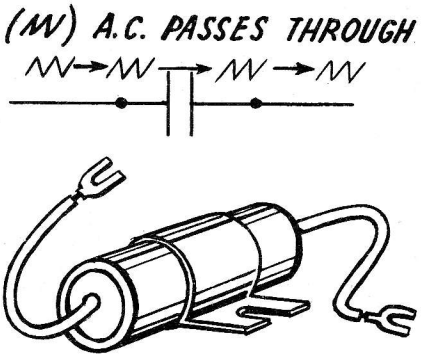


FIG.3. CONDENSER

Although resistors control the current they do not prevent radiation from the spark plugs and wiring. The interference can be still further reduced by placing a metal shield (Fig. 2.) over the spark plugs and by running the high tension wires through flexible metal tubes (braided conduit)

A condenser (Fig. 3) will pass freely an alternating current but will not pass a direct current such as exists in the vehicle battery system.

An inductance coil (Fig. 4) will pass a direct current but hinders the passage of an alternating current.

Fortunately radio interference voltages and currents are alternating in nature, and upon this fact the suppression of the voltage regulator is based.

Without becoming too technical about this arrangement of condensers and coils, it is easy to see that with

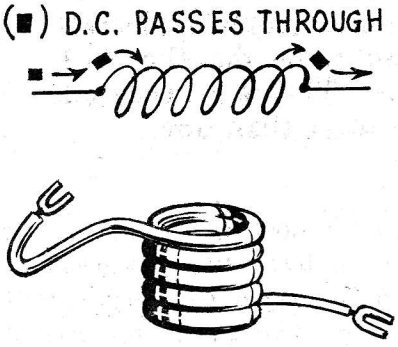


FIG. 4. INDUCTANCE COIL

an inductance coil to prevent alternating current from passing, and a condenser to carry high tension alternating (radio interfering) currents (static) to ground, we can eliminate noises set up by such trouble makers as voltage regulators and still allow for normal function of the circuit (Fig. 5). This arrangement of condensers and coils is called a Filter.

In the vehicle any wires connected to the source of trouble or any metal covering around these wires, or even any metallic object near the source of interference or near another part carrying interference can radiate severely. Hence, grounding, or bonding of the part in question to ground, is necessary.

Ordinarily all metal parts on a vehicle are grounded sufficiently for the operation of the usual low-voltage direct current equipment such as headlamps, horn, tail-lights, fans, etc. However, this grounding is usually not sufficient nor of low enough resistance to be a satisfactory ground for radio interference suppression, and it is necessary to resort to Bonding by means of straps (Fig. 6). These straps are used wherever it is found that any part, such as an engine, particularly when rubber mounted, is not making a good enough contact with the frame or hull.

It is to overcome poor ground connections that ground straps are used on conduits, boxes, engine hoods, engines and the many other places where you have no doubt seen them in vehicles.

Where one of the vehicle's electrical wires is routed to cut through or come near a field of interference, a current of interference voltage is induced in it and is transmitted along the entire length of the wire. Also

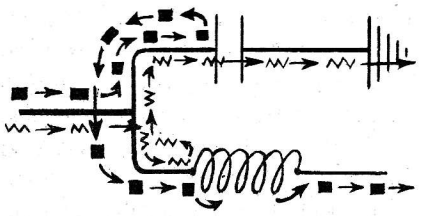


FIG. 5. A FILTER AT WORK

a wire connected to a unit (such as a voltage regulator, or generator), in spite of suppression carries a certain amount of interference voltage along it. Where such a wire runs along side other wires or any ungrounded metallic part, a corresponding interference is set up in this item also. Therefore, if one wire is carrying radio interference (or static), it can result in this interference being transferred to many different parts of the vehicle, where it is radiated to, and picked up by the receiver antenna.

To prevent this, as far as possible, all wires in the low tension circuit are shielded by enclosing them in conduit, solid, flexible, or woven metallic braiding which is grounded at frequent intervals. This practically eliminates the chance that any wire might pick up an interference voltage from a field of static or other wires, or radiate any interference to other wires (Fig. 7.) On tanks, with rubber track pin bushings, the tracks start up interfering voltages in the same way that you get a shock from touching any grounded article or another person after walking across the floor or carpet in the winter. The track blocks store up this static electricity and when they touch the idler wheels or sprockets, they discharge with a spark that interferes with the wireless. To evercome this, two bronze clips are placed on each track pin to connect it to the metallic tube around the rubber bushing (Fig. 8) The pin is connected to the end connector and hence through the next pin and block and so on making a continuous circuit of the track. By this means, since some part of the track is always in contact with the sprocket or idler wheel, the whole

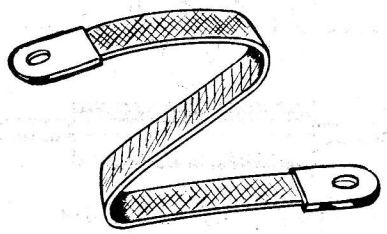


FIG. 6. A GROUND STRAP

track is always grounded to the vehicle and no sparking can take place.

All army vehicles in which wireless sets are installed are suppressed using devices as mentioned above, and most vehicles that are not wireless equipped are suppressed (especially ignition) to prevent their interference with sets in vehicles near them.

Probably the most difficult army

vehicle to suppress is the tank due to its large number of circuits, great variety of electrical equipment and its tracks.

After a tank has been very carefully built, the wiring up to a strict standard, all equipment tested for good insulation and trouble-free operation, it is tested to see that it measures up, as a whole, to the rigid government specification.

This specification is rather complicated but it means that, with everything operating and the wireless receiving a weak signal, no noise will be heard caused by any part of the vehicle.

Testing a vehicle's suppression is not as easy as it sounds. Inside the factory there are interfering voltages constantly being set up and radiated from electric arc-welding equipment, switches on cranes, drill presses, pumps, etc. Outside the plant are electric power transmission lines, electric street cars, telephone lines, and telephone exchanges and ignition circuits from other vehicles all radiating noises easily picked up on the short wave wireless set in the vehicle.

The only answer to the problem is to erect a building that will hold the vehicle and keep out all "radio noises" that do not originate in the vehicle. The "suppression shed" is specially built, not unlike the vehicle itself, bonding straps between doors and walls, filters on electric fans used to expell engine exhaust gases from the shed and flexible or solid conduit on all wiring to prevent radiation of static from the electric light circuit.

After being built to the rigid specification mentioned before, the vehicle is run into the suppression shed and the door closed and bonded, with ground straps, to keep out all static. Then with the engine and all electrical equipment operating the wireless must operate with "no noise". If there is a "noise" the source must be located and remedied.

Now for the MORAL of the story!

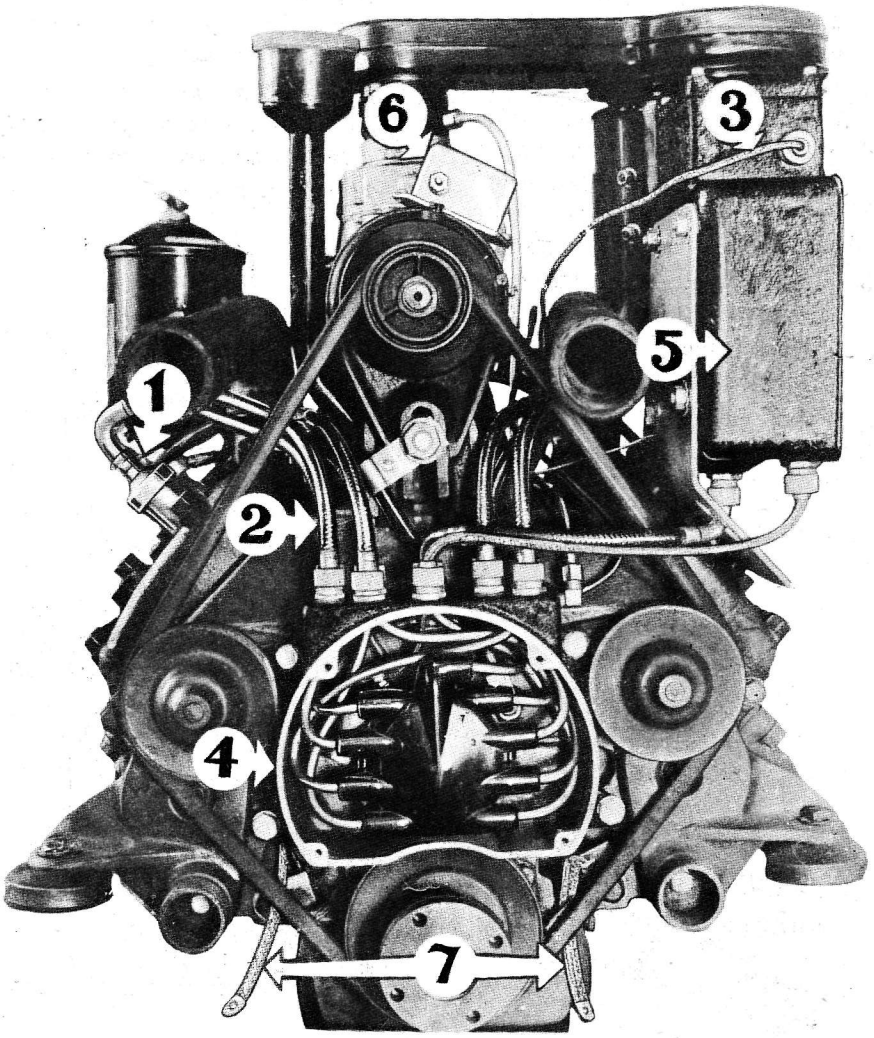


Fig. 7

Ford Engine Showing—

1. **Shield Can over standard spark plug.**
2. **Flexible metal braided conduit.**
3. **Shielded wire.**
4. **Metal shield enclosing distributor.**
5. **Metal shield around ignition coil.**
6. **Radio interference filter in series with the generator leads.**
7. **Ground straps—Engine to chassis.**

You can see from what we've told you the great care taken in suppressing a vehicle and the cost involved, and then think—it can all be wasted by a thoughtless mechanic or driver in a few seconds by leaving off a ground strap, forgetting to return a filter or dropping a heavy box or tool on a conduit!

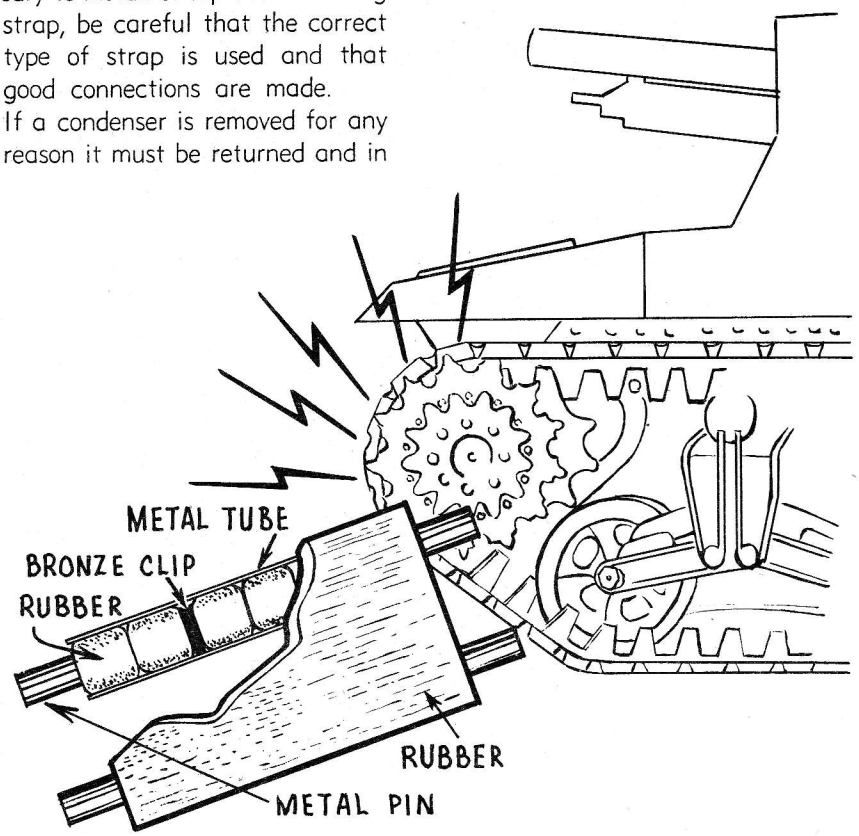
Here are some tips to help keep the suppression of your vehicle in tip top shape.

1. Never try to eliminate interference unless fully qualified to do this work.
2. Whenever any part, such as the engine, is removed from a vehicle, care must be taken to return all

ground straps.

3. Before returning the strap make certain that the surface to which strap is to be bolted is clean. Use sandpaper to remove rust or paint, then apply a thin film of vaseline or grease on the contact surface.
4. All nut and bolt connections of straps must be provided with a lock washer and a plain brass washer under the bolt head.
5. When in service it becomes necessary to install or replace a bonding strap, be careful that the correct type of strap is used and that good connections are made.
6. If a condenser is removed for any reason it must be returned and in the same way as it was before. The same care as for straps must be taken to have good connections and keep resistance as low as possible, and if replaced be certain that the same capacity is used.
7. When soldering straps to the flexible copper braid the solder should not be allowed to run along the braid and so render it inflexible away from the joint. A non-corrosive flux should be used and surplus flux should be removed.
8. Care should be taken to see that the terminal lugs are positioned so that the conductors run straight and that the copper braid conductors are not bent or twisted. Copper braid should not be drawn tight nor allowed to sag.
9. Do not stand on flexible conduit nor allow any heavy metal object such as wrenches or boxes to fall or rest against it.

FIG. 8



You asked for it!

—and in response, twice as many CAM's are being printed. While there is'nt enough for a personal subscription for everyone, they'll be easier to get now. So if you don't see a CAM—ask for it.

Tires

The other day some lads, given the job of mounting tires proceeded to anoint the beads of said tires generously with engine oil to "make 'em go on easy."

What happens to a tire after oil or grease has been on it—even a short time—should happen only to a nazty. Oil attacks rubber and turns it into stuff that makes angel cake look like boiler plate by comparison.

If you must use something to "make 'em go on easy", use a soap solution—you know, soapy water. A solution of 5 parts neutral soap and 95 parts of water is best.

We also hear of the pernicious habit of some more home loving lads of letting some of the air out of the tires of their jeeps to make the ride softer.

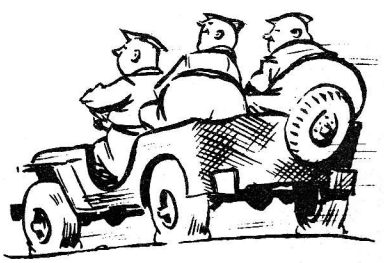
They say if the tires are fully inflated to regulation pressure (27 lbs. all round) the ride is too hard and wears out the men.

But on the other hand, if the tires are under-inflated it wears out the tires.

Now the question is, which would would you rather wear out—the men or the tires? (Glancing at the rear profiles of some of our drivers, we say a little wear in the right places wouldn't do any harm).

But seriously, it took a lot of high-priced engineers a long time to figure out just what pressures would get the most wear out of the little rubber we've got.

For a bunch of guys with soft shells to go ahead and reduce the pressure in order to get that arm-chair sensation!—(Here boy, rush out and get me another dozen marshmallows for the seat of my chair).



Watch your Pistol's Diet!

Just the other day I am sitting at the controls of my desk, carefully minding my own business, when in walked L/Cpl. Kizel and gives me a very large hello. Well, as I do not like having my meditations interrupted, I return him a small hello and go back to sleep. I figure, of course, that these tactics will rapidly discourage him. However, he opens the left hand drawer of my desk and starts leafing through the old orange peelings, burnt matches and used blotters and lifts out a revolver from the corner, asking many very loud questions.

Now this revolver is somewhat unusual, due to the fact that a very large explosion, at some time previous to this, blows out two chambers of the cylinder, tears the top strap completely off the frame,. bends the barrel forward at an angle no self-respecting barrel will bend at if it has any choice about it and generally does no good whatsoever to the pistol. So I rapidly take an interest in what Kizel is saying.

"Why", he says, "what happens to the character who is holding this when it acts in such a surprising manner?" and "What causes this thing to happen?" and many other such things until I stop him by answering as follows:

"When I first acquired this revolver, which is originally a standard issue .38" pistol that takes many war workers a long time to make and costs John Q. Public a good few potatoes, I make enquiries as to the conditions surrounding this mishap, and a few odd technical details, which I will relate to you".

"It appears that the character who is originally issued with this revolver finds one day that he is running short of the .380" ammunition that the government gives him to shoot in it and being an ambitious sort of person, he experiments around and about until he finds that some 9 mm. cartridges he has on hand to use in some Sten guns, fit nicely into the chambers of his revolver even though they have no rim and are difficult to extract at all times, particularly after firing, but this latter detail does not bother him at all as he has lots of time to poke the empties out with a pencil anyway, so he goes ahead and fires many rounds happily away before he discovers his folly."

"It seems that this 9 mm. ammunition develops a muzzle energy of about 365 foot pounds against the muzzle energy of about 240 foot pounds developed by the .380 ammunition issued for use with the issue pistol and this extra hundred odd foot pounds of energy piles up pressure within the barrel and chamber, much in excess of what it is designed for so that the metal soon becomes very strained and much fatigued. It is because of this above fact that our friend one day finds himself picking pretty, dark blue pieces of revolver out of what is left of his right hand."

"So I am personally willing to lay long odds that that same character will never again attempt to fire 9 mm. ammunition in any .38" revolver—at least not with his right hand.

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Gas Tank Topes-

A scented note from the Ford fellahs tells us the top of the gas tanks on lots of C.M.P. vehicles are being used for a step. The gas tanks, as the name suggests, were designed solely for holding the gasoline and the top of the tank is flexible. It's not that they're worried so much about the looks of the tank with the top dented in—you're the one that'll catch Heck's Bells for that, but, as pointed out in the letter, more serious happenings take place.

The outlet tube is fastened to the gasoline tank top and runs directly towards the bottom of the tank at the sediment sump. The bottom of the pipe is bevelled and is set approximately 1/2" above the opening of the sump.

So when the top of the tank is dented down, due to some Joe with overdeveloped clamber glands climbing on it a few times, the pipe gets pushed down to the bottom of the sediment sump and any stuff, dirt and what-have-you gets forced into the fuel system.

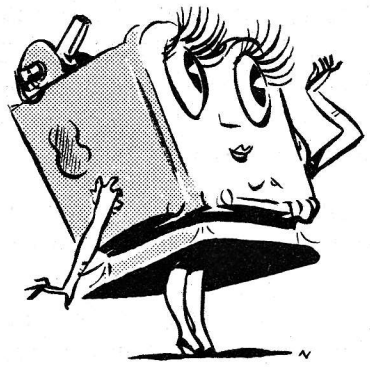
Later vehicles will have a shorter pipe which will help eliminate this condition, but your vehicle has the long one—so keep them big feet offer that there gas tank!!

FIRE CONTROL INSTRUMENTS

HOT TIPS ON COLD WEATHER OPERATION

First of all we hope you aren't smart like the fellow who thinks we're talking about fire extinguishers. We aren't. What we mean is predictors, telescopes, dial sights and all that sort of thing. This is the fire control equipment which tells the gunner where to aim the gun so that the projectile hits Jerry where it hurts most.

There are, unfortunately for some people, two kinds of fire control instruments—



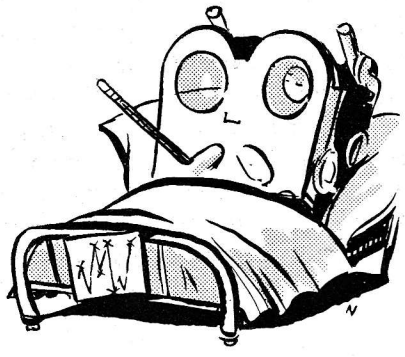
(a) good
(b) bad

The first kind is the only one that comes out of an Ordnance depot. Making sure of this causes headaches to a very large number of dissipated looking people, most of whom are usually about to have a nervous breakdown.

The second kind only occurs after good fire control instruments have been cared for by blokes who don't know the difference between a beautiful girl and a locomotive. They seem to think because they are both referred to as "she" that the former should be handled like the latter. Treat your instruments like you would naturally treat the former—with love and affection and you can "tell your ammunition where to go instead of asking where it went".

The instruments used by the Royal Canadian Artillery are the best in the world. In order to keep them that way exert every possible effort to understand unit maintenance procedure and then carry it out to the letter.

Here are a few of the dangers of winter operation against which every gunner must guard religiously—



Quick temperature changes—These cause internal stresses in the instruments and although they are not apparent, they may cause dangerous errors in gunnery.

Condensation—Any B.F. can make beautiful frost pictures on lenses on a cold day by breathing down the neck of an optical instrument. If he blames poor gunnery on Gremlins afterwards, wring his neck. Lenses should always be clean and **dry,** otherwise the glass may become dull and corroded.

Internal condensation is much more dangerous and will occur if the sealing or desiccators (when fitted) are not O.K. If you get curious about the works of a predictor or other instrument, **don't** get out your stillson wrench and find out for yourself. Dismantling is absolutely forbidden.

Remember that desiccators must be regenerated regularly.

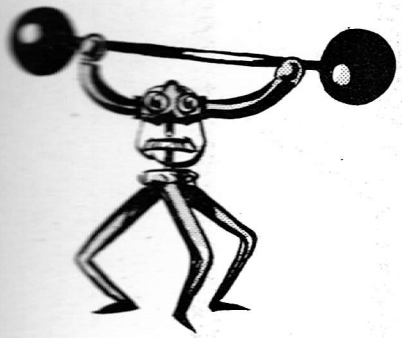
Lubrication—Did you know that a year round grease and oil have been authorized and that your instruments may fail you in cold weather if they are not correctly lubricated?

Did you know that too much grease is almost as harmful as not enough? The extra grease causes extra "drag" which is dangerous to delicate parts, and entirely unnecessary

Danger—
No elastic!

Cold weather reduces the elasticity of all parts of instruments especially plastics, metals and glass.

This would suggest that instruments won't make very good footballs in cold weather. This is also true of warm weather. Take our word for it and handle them gently—or maybe you dont' know how much those babies cost.



Exercise

Every instrument must have a regular work-out to keep it "limbered-up" in cold weather. Run test problems according to existing instructions because they are the surest way to detect cold weather failures.

Dial Sights, directors and other instruments for which test problems are not specified should have their moving parts tested regularly to ensure that when Number One calls "Fire", your punch will hit the target squarely between the eyes.

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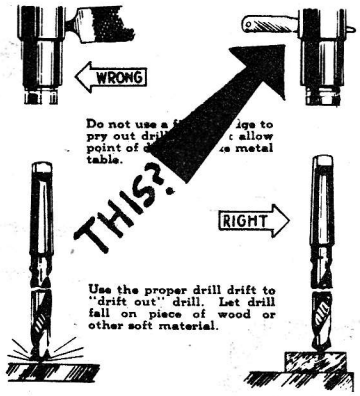
Here lies the body of Pte Bray
Who died maintaining his right-of-way,
He was right—dead right as he sped along
But he's just as dead as if he'd been wrong.

About Removing those Drills!

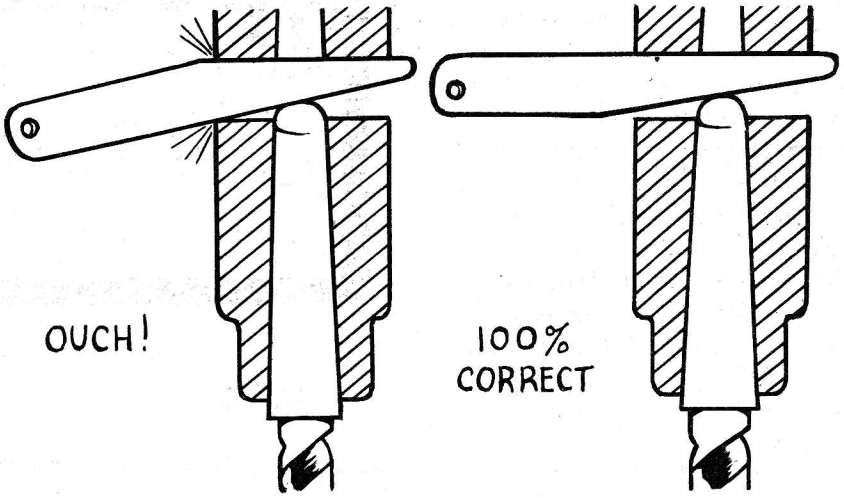

TO REMOVE DRILL
FROM SOCKET OR SLEEVE
WRONG
THIS?
RIGHT
Use the proper drill drift to "drift out" drill. Let drill fall on piece of wood or other soft material.

A bouquet of Lollypops to Q.M.S. V. M. Simmons, Camp Debert, for his constructive letter on removing drills with a drift.

Remember, we showed a picture in the December issue something like this.

Well, as Q.M.S. Simmons points out, due to the angle of the drift, by using it this way there's a good chance of the drift wedging in the clearance hole at the top of the tang on the drill or else the body of the drift will wedge in the drill press column before the drill can be removed.

Here's the way the Quarter would do it—scoring 100% correct.



Don't use the wrong oil in the wrong place. Salad oil, hair oil and castor oil have different uses. So have the various grades recommended by your Canadian Army Lubrication Guides and instruction books.

* * *

If you check the engine oil while the engine is running, don't believe what the dipstick tells you—because the reading won't be right.

* * *

Don't bend the central electrode of a spark plug to adjust the gap. You'll only crack the porcelain, and a plug with **two** gaps isn't much good.

BRIGHTEN YOUR OUTLOOK

A dirty, foggy windshield picks up glare like a soft tire picks up nails. When the sun shines bright on your old, dirty, Kentucky windshield, you're practically a blind man. And at night when oncoming headlights hit your dirty windshield, you can't see anything. Don't be a mole, you mole, get a clean rag and **brighten your outlook.**

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SHORTY SIRKIT—

(Continued from page 89)

matter but when we consider the 1.4 volt valves and other miniatures we find that due to their small size the grid and filament are very close together and with voltages of more than fifty volts applied the electrostatic attraction will pull the two elements together causing the tester to show a short. This indication should be disregarded as a real filament grid short occurs when there is a break in the filament anchorage causing it to come in contact with the grid. This type of short can be easily determined by a continuity test.

The figures also would seem to indicate that the practice of breaking off one of the tube prongs to indicate a defective tube is not a good one as one in four tubes may still be good. Still another interesting item from the same report tells us that from approximately 14,000 transmitting tubes returned the following amounts of vital metals could be salvaged:

61.86	lbs. of	Tungsten
1.97	" "	Tantalum
7-.90	" "	Molybdenum
69.69	" "	Aluminum
525.13	" "	Brass
2,027.88	" "	Copper
18.78	" "	Block tin

Come to think of it these figures are certainly food for thought.

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CAM IS FREE!

It's YOUR magazine so feel free to send in any original articles or ideas that you have dealing with maintenance. If you have any problems shoot them to us too. We don't know all the answers, but we can get them. You get us by addressing The Editor, CAM, Directorate of Mechanical Maintenance, Department of National Defence, OTTAWA.

CARBURETOR—

(Continued from page 82)

that goes to the cylinders is "richer" in fuel. Of course, as we said before, the automotive designers have not favoured carburetors that looked like tea kettles for sometime now—but you'll easily see the principles we've been talking about in the cutaway drawing of a regular updraft carburetor. (Fig. 6.).

Next month we'll carry on from here with more refinements to our embryo carburetor.

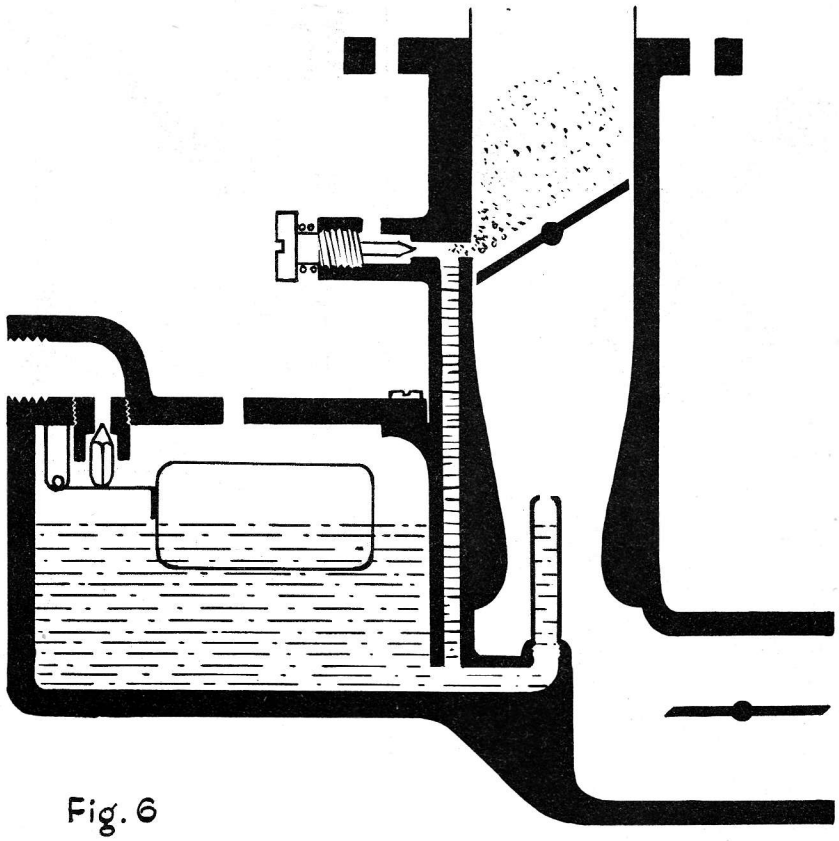


Fig. 6

Lube Level...

The level in the front axle of the ¼-ton jeep should be maintained at exactly plug level. It was discovered that if the lube level is allowed to fall below plug level, there's a danger that the pinion-shaft bearings will not get enough lubricant.

Thing is, in the jeep front-axle-housing center section, there's a lip cast in the case, the purpose of which is to deflect the lube whipped up by the ring gear into the channel above the pinion-shaft bearings to supply those bearings with lubricant.

But if the level is allowed to fall below the plug level, there's a very good chance that the bearings won't get enough oil to keep them going.

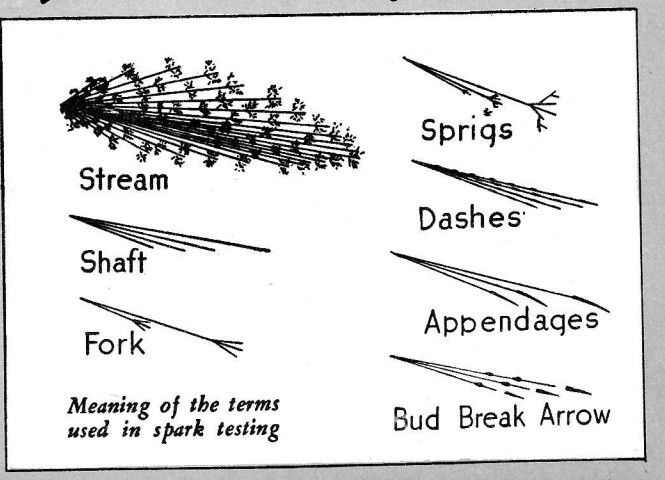
The jeep front-axle housing is comparatively large at the plug opening but quickly tapers down to a "V" bottom—so if you follow the 1/2-inch-below-the-plug-level rule, you remove 28% of the lubricant, which is enough to starve the pinion-shaft bearings.

Keep the lube up to plug level in the 1/4-ton-jeep differentials—front and rear.

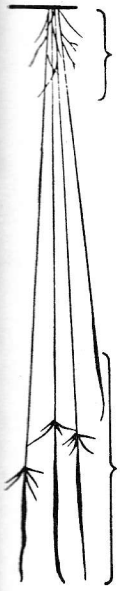
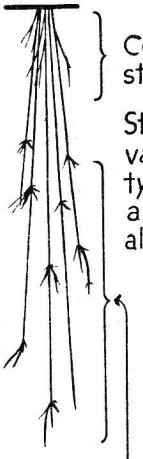
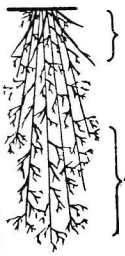
Identifying Metals by Spark Testing

SPARK tests should be made on a high speed power grinder, and the specimen should be held so that the sparks will be given off horizontally. For most accurate results, the sparks should be examined against a dark background, preferably in a dark corner of the shop.

The color, shape, average length, and activity of the sparks are details which are characteristics of the material tested. Spark testing can be a very accurate method of identifying metals but it requires considerable practice and experience to become an expert. Several common sparks are given in the table. If the operator learns the technique for identifying these metals readily, he will soon be able to expand his experience to include others by observation and comparison with the sparks from known samples.



Meaning of the terms used in spark testing

Wrought Iron	Low-Carbon Steel*	High-Carbon Steel	Alloy Steel**
 Color - straw yellow Average stream length with power grinder - 65 in. Volume - large Long shafts ending in forks and arrowlike appendages Color - white	Color - white Average length of stream with power grinder - 70 in. Volume - moderately large Shafts shorter than wrought iron and in forks and appendages Forks become more numerous and sprigs appear as carbon content increases	Color - white Average stream length with power grinder - 55 in. Volume - large Numerous small and repeating sprigs	 Color - straw yellow Stream length varies with type and amount of alloy content Shafts may end in forks, buds or arrows, frequently with break between shaft and arrow. Few, if any, sprigs Color - white
White Cast Iron	**Gray Cast Iron**	**Malleable Iron**	**Nickel***
Color - red Color - straw yellow Average stream length with power grinder - 20 in. Volume - very small Sprigs - finer than gray iron, small and repeating	 Color - red Color - straw yellow Average stream length with power grinder - 25 in. Volume - small Many sprigs, small and repeating	Color - straw yellow Average stream length with power grinder - 30 in. Volume - moderate Longer shafts than gray iron ending in numerous small, repeating sprigs	Color - orange Average stream length with power grinder - 10 in. Short shafts with no forks or sprigs

*These data apply also to cast steel

**Spark shown is for stainless steel

***Monel metal spark is very similar to nickel

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In this day of shortages, the big feature is "Reclamation"—recovering materials and repairing bits and pieces that would otherwise be junked.

When a part goes on the blink, don't just holler for a new one off the shelf—before you try fixing the one you've got. A spot of welding or brazing, a reinforcement, a new bolt, may put it in shape again. Use your own initiative and brains to figure out ways and means of helping to save vital materials and parts 'cause THEY DON'T GROW ON TREES!